

FURTHER ATTRIBUTES OF THE PERENNIAL VEGETATION IN THE ROCK VALLEY AREA OF THE NORTHERN MOJAVE DESERT

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ABSTRACT.— Above-ground and below-ground biomass, percent dead shrubs by species, and percent of dead stems of living species were determined for a site in the northern Mojave Desert.

The Rock Valley area of the northern Mojave Desert was used as an International Biological Program (IBP) Desert Biome validation site (Turner, 1973, 1975, 1976, Turner and McBrayer, 1974). Some characteristics of the vegetation of that site are described elsewhere in this volume (El-Ghonemy et al. 1980, Wallace et al. 1980). This report summarizes some other aspects of the vegetation on this site.

MATERIALS AND METHODS

The techniques used are described in El-Ghonemy et al. (1980). Briefly, a total of 4282 randomly selected individuals over the large plot was used in the study. Each individual was identified and subjected to various measurements. Live and dead plants were also determined.

Abiotic data for the area have been recorded in the validation site reports (Turner, 1973, 1975, 1976, Turner and McBrayer 1974). The zone numbers (20 to 25) are defined in these reports.

RESULTS AND DISCUSSION

The dry weight estimates of the stem portions of the plants are in Table 1. These values obtained by dimension analysis (Wallace and Romney 1972) were used to calculate the aboveground stem biomass per unit area (Table 2). The ratios of root/stem obtained in one study (Wallace et al. 1974) and corrected

in another (Wallace et al. this volume 1980) were used to calculate below-ground standing biomass for this area (Table 2). The proportion of below-ground biomass is greater than that obtained with our ¹⁴C techniques, but does seem to be a bit lower than that obtained for the Great Basin desert (Caldwell and Camp 1974).

Carcasses of many dead shrubs were on the site, and numbers were determined for each of the major perennial species as percent of dead to live plus dead numbers (Table 3). On the average, from 10 to 15 percent of the individuals for each species were dead. The correlation coefficients between the number of plants per hectare and percent dead were not significant (Table 3).

It can be expected that there is some relationship between the percent of dead plants and longevity. Species with the largest span of life most likely would show the smallest percentage of dead plants at any one time. This hypothesis, of course, would be in error if any species took several times as long as another to decompose and disappear from the system. This does not seem to be the case, however. *Ephedra nevadensis* S. Wats. and *Atriplex confertifolia* (Torr. & Frem.) S. Wats. then would have the shortest life span of the shrubs represented. *Krameria parvifolia* Benth. and *Lycium andersonii* A. Gray would have the longest.

Each plant had a portion of dead wood, and an estimate of it for each species is also given in Table 3. It is noted that half or more of the stems of *Ambrosia dumosa*, *Atriplex*

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confertifolia, *Ceratoides lanata*, and *Larrea tridentata* were dead. No species had more than 26 percent of its stems dead on the average.

Results from this investigation indicate that vast areas of the northern Mojave Desert support stands of vegetation in which as much as one-fourth of the standing crop may be dead wood. This represents a large reservoir of organic material that eventually must undergo breakdown, decomposition, and mineralization. The fact that so much of this dead wood remains standing above ground for decades after death suggests that either

the woody material has little value as food for existing insect populations, it is resistant to breakdown by insects or microbes, or species are not present to serve the role in stem tissue breakdown that exists in less arid ecosystems.

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TABLE 1. Mean dry stem weight (g) and its standard deviation per plant determined by random quadrat counts and dimensional analysis in Rock Valley validation site.

| SPECIES | ZONE | | | | | |
|-----------------------------------|-------|-------|-------|-------|-------|-------|
| | 20 | 21 | 22 | 23 | 24 | 25 |
| 1. <i>Acamptopappus shockleyi</i> | 48.8 | — | — | — | — | 60.9 |
| Standard deviation | 59.2 | — | — | — | — | 45.1 |
| Number | 10 | — | — | — | — | 9 |
| 2. <i>Atriplex confertifolia</i> | — | — | — | — | 48.5 | 16.4 |
| Standard deviation | — | — | — | — | 33.9 | 21.6 |
| Number | — | — | — | — | 20 | 17 |
| 3. <i>Ephedra nevadensis</i> | 109.5 | 46.7 | 138.9 | 126.7 | 150.9 | 162.5 |
| Standard deviation | 225.5 | 67.9 | 132.1 | 88.0 | 345.2 | 204.5 |
| Number | 182 | 41 | 41 | 33 | 20 | 70 |
| 7. <i>Ceratoides lanata</i> | 59.7 | 51.1 | 54.9 | 46.9 | 80.0 | 80.0 |
| Standard deviation | 91.2 | 53.6 | 64.8 | 103.2 | 109.4 | 111.3 |
| Number | 33 | 46 | 4 | 50 | 32 | 69 |
| 8. <i>Ambrosia dumosa</i> | 108.8 | 73.0 | 133.8 | 100.4 | 124.2 | 107.1 |
| Standard deviation | 98.0 | 78.3 | 160.4 | 102.2 | 127.8 | 104.7 |
| Number | 390 | 120 | 107 | 89 | 182 | 295 |
| 9. <i>Grayia spinosa</i> | 108.8 | 89.3 | 162.3 | 82.1 | 70.8 | 65.7 |
| Standard deviation | 123.3 | 106.5 | 234.7 | 112.6 | 73.7 | 66.6 |
| Number | 44 | 34 | 9 | 42 | 160 | 302 |
| 11. <i>Kramaria parvifolia</i> | 134.5 | 129.1 | 126.8 | 170.2 | 156.0 | 133.6 |
| Standard deviation | 87.8 | 97.1 | 97.8 | 128.5 | 117.9 | 106.5 |
| Number | 419 | 46 | 75 | 32 | 56 | 104 |
| 12. <i>Larrea tridentata</i> | 455.9 | 433.2 | 386.5 | 386.3 | 511.7 | 372.8 |
| Standard deviation | 481.2 | 424.1 | 393.6 | 348.0 | 517.5 | 385.8 |
| Number | 240 | 44 | 43 | 24 | 73 | 93 |
| 14. <i>Lycium andersonii</i> | 386.0 | 393.2 | 362.4 | 224.4 | 362.8 | 320.5 |
| Standard deviation | 250.3 | 253.8 | 212.1 | 220.9 | 245.0 | 218.7 |
| Number | 243 | 22 | 35 | 17 | 6 | 28 |
| 15. <i>Lycium pallidum</i> | 275.4 | 322.8 | 395.7 | 191.5 | 325.0 | 202.3 |
| Standard deviation | 166.1 | 227.4 | 253.3 | 157.6 | 250.6 | 182.9 |
| Number | 19 | 34 | 8 | 16 | 59 | 91 |

TABLE 2. Stem and root dry weight per hectare (kg/ha) in the Rock Valley validation site.

| SPECIES | ZONE | | | | | | | | | | | |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 20 | | 21 | | 22 | | 23 | | 24 | | 25 | |
| | Stem | Root | Stem | Root | Stem | Root | Stem | Root | Stem | Root | Stem | Root |
| <i>Acamptopappus shockleyi</i> | 2.2 | 2.1 | — | — | 1.0 | 0.8 | 4.6 | 4.2 | 0.9 | 0.9 | 6.2 | 5.8 |
| <i>Atriplex confertifolia</i> | — | — | — | — | — | — | — | — | 13.4 | 10.0 | 3.1 | 2.3 |
| <i>Ephedra nevadensis</i> | 93.0 | 138.1 | 39.5 | 57.9 | 163.5 | 239.6 | 182.2 | 266.9 | 41.5 | 60.9 | 127.6 | 186.9 |
| <i>Ceratoides lanata</i> | 9.3 | 14.7 | 48.6 | 76.7 | 6.7 | 10.5 | 102.2 | 161.5 | 35.4 | 56.0 | 61.8 | 97.6 |
| <i>Ambrosia dumosa</i> | 200.6 | 406.6 | 180.6 | 366.1 | 401.1 | 813.1 | 389.3 | 789.0 | 311.0 | 630.4 | 364.4 | 738.7 |
| <i>Grayia spinosa</i> | 22.1 | 27.7 | 62.7 | 78.6 | 40.9 | 51.4 | 150.2 | 188.5 | 155.9 | 195.7 | 222.6 | 279.4 |
| <i>Krameria parvifolia</i> | 263.2 | 364.5 | 122.8 | 215.5 | 266.7 | 369.3 | 237.3 | 328.5 | 120.6 | 167.1 | 155.8 | 215.7 |
| <i>Larrea tridentata</i> | 511.5 | 1113.2 | 392.9 | 689.5 | 465.6 | 1013.2 | 404.1 | 879.4 | 513.7 | 1117.0 | 388.8 | 846.1 |
| <i>Lycium andersonii</i> | 438.5 | 642.5 | 177.7 | 260.4 | 355.5 | 520.9 | 160.0 | 234.5 | 30.1 | 44.1 | 100.6 | 147.4 |
| <i>Lycium pallidum</i> | 24.2 | 69.8 | 227.9 | 658.3 | 88.6 | 255.5 | 133.5 | 385.6 | 264.9 | 765.0 | 206.3 | 596.0 |
| Total | 1564.6 | 2779.2 | 1252.7 | 2403.0 | 1789.6 | 3273.5 | 1763.4 | 3238.1 | 1487.4 | 3047.1 | 1637.2 | 3115.9 |
| Total root + stem | 4343.8 | | 3655.7 | | 5063.1 | | 5001.5 | | 4534.5 | | 4753.1 | |

TABLE 3. Standing dead plant material on the Rock Valley validation site in 1971 separated into the percentage of dead shrubs out of the total shrubs calculated from random quadrat counts (given in columns 1-7) and into the percentage of dead wood as a portion of living shrubs derived from destructive whole shrub sampling given in Column 8.

| Species | ZONE | | | | | | Total site* | Dead wood as percent of standing live and dead stem | Correlation coefficient (percent dead × no. of shrubs per ha) r |
|-------------------------------|----------------------|------|------|------|------|------|-------------|---|---|
| | 20 | 21 | 22 | 23 | 24 | 25 | | | |
| | Dead shrubs, percent | | | | | | | | |
| <i>Ambrosia dumosa</i> | 6.8 | 14.4 | 7.8 | 17.1 | 13.2 | 13.4 | 11.2 ± 4.0 | 66.5 | +0.70 |
| <i>Atriplex confertifolia</i> | — | — | — | — | 29.3 | 21.0 | 25.4 ± 5.9 | 54.9 | — |
| <i>Ephedra nevadensis</i> | 26.1 | 20.8 | 29.9 | 6.8 | 12.8 | 19.4 | 22.5 ± 8.5 | 29.4 | -0.10 |
| <i>Ceratoides lanata</i> | 1.4 | 3.7 | 6.9 | 7.9 | 8.6 | 9.1 | 6.5 ± 3.1 | 66.3 | +0.31 |
| <i>Grayia spinosa</i> | 7.6 | 16.2 | 21.4 | 7.0 | 13.7 | 12.6 | 11.4 ± 5.4 | 47.9 | -0.24 |
| <i>Krameria parvifolia</i> | 0.9 | 1.7 | 1.9 | 3.1 | 0.6 | 1.4 | 1.2 ± 0.9 | 32.8 | +0.19 |
| <i>Larrea tridentata</i> | 7.2 | 6.0 | 4.4 | 11.7 | 4.8 | 9.3 | 7.1 ± 2.8 | 68.6 | -0.13 |
| <i>Lycium andersonii</i> | 1.3 | 5.0 | 10.0 | 2.2 | 0.0 | 4.9 | 2.7 ± 3.6 | 29.2 | +0.32 |
| <i>Lycium pallidum</i> | 1.4 | 5.6 | 21.3 | 2.0 | 5.7 | 6.0 | 5.7 ± 7.3 | 26.1 | -0.29 |

* ± is standard deviation.

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